

Studies on Preparation and Quality Evaluation Of Biscuit Prepared from Composite Flour of Green Gram, Wheat and Maize

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Abstract: The research work was undertaken to develop the technology for preparation and quality evaluation of biscuit prepared from composite flour of green gram flour, wheat and maize and to study the changes in chemical composition and sensory qualities of the Biscuit with different proportions of flour of Green gram, Wheat and Maize at department of Agricultural Process Engg., K. K. Wagh College of Agriculture Engg. and Technology. Different treatments were used for the study using different proportion of flour of Green Gram, Wheat and Maize namely T-1, T-2, T-3, T-4, T-5 and T-6. Moisture content of composite flour biscuit varied from 2 to 5%. It was found that T3 contain maximum moisture content. Ash content of biscuit varied from 1.12 to 1.88. It was found that T3 contain maximum ash content. On the basis of sensory score and Physico-chemical composition we found that treatment T1 (25:25:50) was found best.

Keywords: Biscuits, Physical analysis, sensory evaluation

I. INTRODUCTION

Biscuits are popular foodstuff consumed by a wide range of population due to their varied taste, long shelf life and relatively low cost. Because of competition in the market and increased demand for healthy, natural and functional products, attempts are being made to improve the nutritive value of biscuits and functionality by modifying their nutritive composition. Such effects are very often achieved by increasing the ratio raw materials other than wheat or different types of dietary fibers in basic recipes with the attempt to increase biscuit's protein and mineral content for quality and availability or increase dietary fiber content and improve prebiotic characteristics of the final product (Gallagher, 2003). Biscuits represent a fast growing segment of food because of consumer demands for convenient and nutritious food products. The consumers demand has increased for the quality food products with taste, safety, convenience and nutrition (Lubna Masoodi., 2012).

Green gram is one of the important pulse crops in India. It has been reported that Green gram has been cultivated in India since ancient times. It is a protein rich staple food. It contains about 25 percent protein, which is almost three times that of cereals. It is consumed in the form of split pulse as well as whole pulse the moong dhal Khichdi is recommended to the ill or aged person as it is easily digestible and considered as complete diet.

Wheat is the most widely cultivated cereal crop in the world and mainly used for milling and baking. Some wheat varieties (e.g. *Triticum aestivum*) are suitable for bread making while others (e.g. *Triticum durum*) are suitable for biscuits making (Sapirstein *et al.*, 2007). Gluten, the protein component of flour which gives the dough elasticity and strength, can be defined as the rubbery mass that remains when wheat dough is washed to remove starch granules and water soluble constituents (Kaushik, 2013). In wheat products such as bread, gluten network formation is desirable for gas retention and better volume of product, while in products such as biscuits, extensibility is required, so gluten formation is undesirable. Gluten-modifying agents such as oxidizing and reducing agents are used in controlling the rheological properties of wheat flour (Sandhu, 2011). Reducing agents cleave the intermolecular and intra-molecular disulfide bonds in the gluten proteins. This cleavage results in reduced molecular weight for the proteins, and the extensibility of the dough is increased (Stauffer, 1994).

The composite flours from cereals such as maize are known to be rich in protein (Abdel-kader, 2000). Quality Protein Maize (QPM) was developed through convectional maize breeding methods and has about 10% protein like any Normal Maize (NM) variety. However, its protein has about 70% higher levels of the essential amino acids - lysine and tryptophan. Thus the nutritional quality of its protein is superior to that of normal maize varieties. This is important because non-gastric organisms (including humans, pigs and poultry) are unable to synthesize their

own lysine and tryptophan. Hence, they stand to benefit more, nutritionally, from QPM than NM (Giwa, 2009) the utilization of QPM in the production of baked goods is not well known in Nigeria and there is scanty information on the utilization of QPM in Nigerian foods. Hence, this study looks into the quality attributes of biscuit produced from composite flour from QPM flour and wheat flour.

Objectives

Taking all this point in view present study was carried out with the following objectives

1. To produce a nutritionally balanced biscuit from composite flour of Green gram, Wheat and Maize.
2. To Study the sensory characteristics of biscuit.
3. To Study the physical and chemical parameters of biscuit.

II. MATERIALS AND METHODS

The experimental study was carried out in the laboratories of Food Science and Technology, K.K. Wagh College of Food Technology and Agril. Process Engg. K.K. Wagh College of Agril. Engg. and Technology, Nashik. The methodology adopted has been described below:

Raw Material Used

1. Flour:

Green Gram, Wheat and Maize were procured from local market.

Preparation of flour:

Whole Green Gram, Wheat and Maize were grind in flourmill. These flours were used for preparation of composite flour of Green gram, Wheat and Maize.

Preparation of dough (blend):

Take flour of Green Gram, Wheat and Maize in Required proportion. Three test for Sugar and Three tests for jigger. Mix all ingredients in the composite flour and make dough (blend).

Baking of Biscuits:

Prepared Biscuits were baked in baking oven till the surface of biscuit get change into light brown color. After baking remove biscuits from oven and cool for some time.

Detail procedure-

3.3.1. Raw material:

Green gram flour, wheat flour, maize flour, sugar, baking powder, ghee, and cardamom powder, jiggery was purchased from local market of Nashik.

3.3.2 Experimental plan:

The experimental plan used for the present research is given in Table 3.1 which shows the description about Biscuit, ingredient used for preparation of biscuit, sample tests and analysis. Figure 1 shows the flow chart for the preparation biscuits. Table 3.2 shows the different combination of Wheat flour; Green gram flour and Maize flour for biscuit preparation for six different treatments and table 3.3 shows the ingredients used and their required proportion in the preparation of composite flour Biscuits.

Table 3.1: Levels of input variables for experimental set up

Sr. No.	Parameter	Level	Description
1	Product	1	Biscuit
2	Ingredients	7	Baking Powder, Wheat flour, green gram flour, maize flour, ghee, jaggery, cardamom powder and Sugar.
3	Samples	6	T-1, T-2, T-3, T-4,T-5,T-6
4	Analysis	3	Sensory-analysis, Physical Analysis & Physico-chemical Analysis.

Table 3.2: Experimental Plan.

Treatment	Maize (gm)	Green gram (gm)	Wheat (gm)	Sugar (gm)	Jaggery (gm)
T-1	50	25	25	--	50

T-2	25	50	25	--	50
T-3	25	25	50	--	50
T-4	50	25	25	50	--
T-5	25	50	25	50	--
T-6	25	25	50	50	--

Preparation of Biscuits

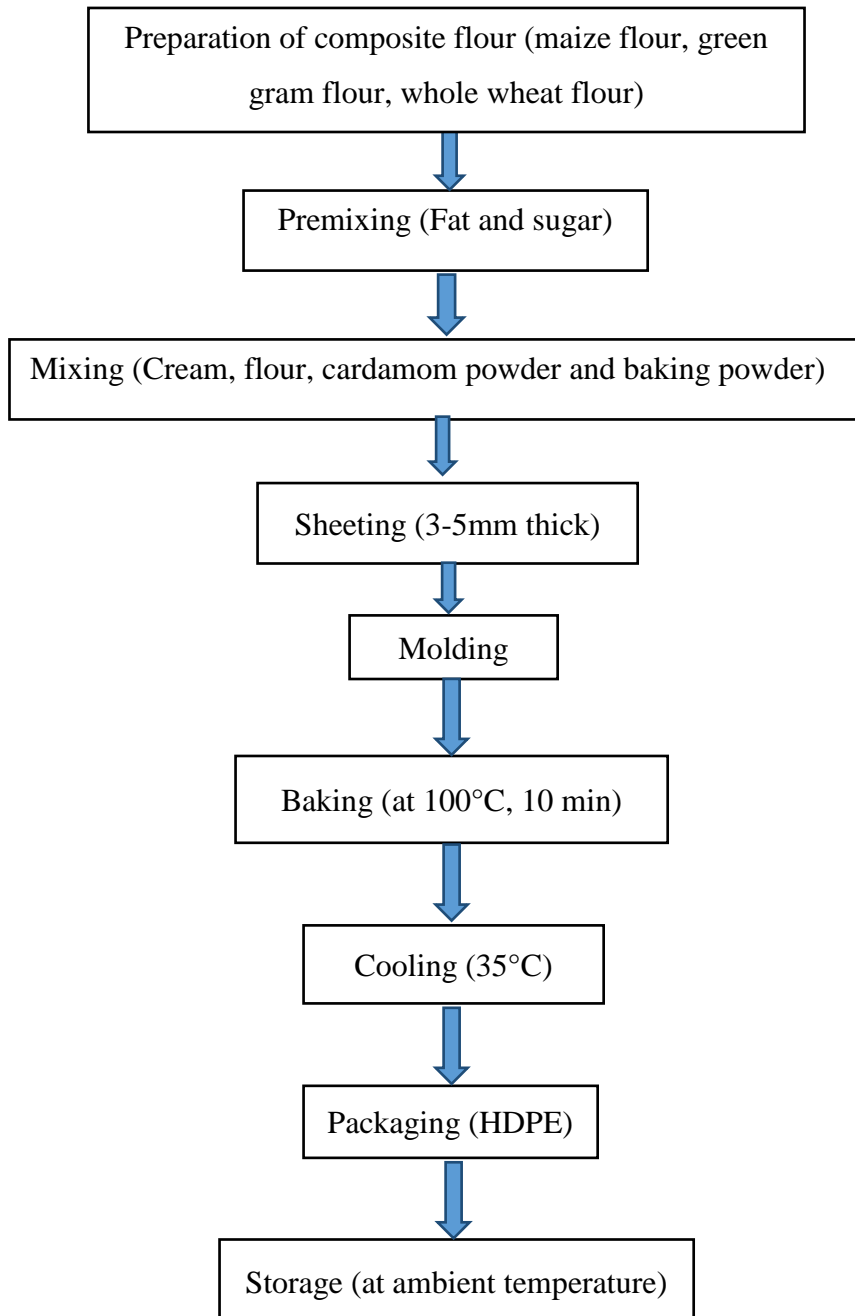


Figure 3.3: Flow chart for the Preparation of Biscuits.

Table 3.3: Ingredients used in preparation of biscuits

Sr. no.	Ingredients	T1	T2	T3	T4	T5	T6
1	GGF	25	50	25	25	50	25
2	WF	25	25	50	25	25	50
3	MF	50	25	25	50	25	25
4	Sugar	--	--	--	50	50	50
5	Baking Powder	2	2	2	2	2	2
6	Ghee	50	50	50	50	50	50
7	Jaggery	50	50	50	--	--	--
8	Cardamom powder	2	2	2	2	2	2

Chemical Analysis of Composite flour biscuits

Moisture content:

The moisture content of the developed biscuit was determined by the method described in AACC (2000).

$$\text{Moisture (\% (w.b))} = \frac{W1-W2}{W1-W} * 100$$

Where,

W = weight in gram of the empty moisture dish.

W1 = weight in gram of the moisture dish with the material before drying.

W2 = weight in gram of the moisture dish with the material after drying.

Ash content:

The ash content was determined by the method described in AACC (2000), Method no. 08-01.

$$\text{Total ash \%} = \frac{W2-W1}{W1-W} * 100$$

Where,

W = weight in gram of the empty dish.

W1 = weight in gram of the dish with dried material taken for test.

W2 = weight in gram of the dish with the ash.

Physical parameters:

Spread ratio: The spread ratio was determined by using this formula.

$$\text{Spread ratio} = \frac{\text{diameter (mm)}}{\text{thickness (mm)}}$$

Thickness: The thickness was measured in mm by screw gauge.

Volume: Volume of biscuit is defined as the area of the biscuit multiplied by thickness

$$\text{Volume (cm3)} = d^2 \frac{\pi}{4}$$

Where,

t = Average thickness of biscuit (mm)

d = Diameter of biscuit (mm)

Diameter: The diameter was measured in mm by Vernier caliper.

Density: After calculating volume, density was obtained by ratio of weight of volume (AACC 1983).

$$\text{Density } \left(\frac{\text{g}}{\text{cm}^3}\right) = \frac{\text{mass of sample (g)}}{\text{volume of sample (cm}^3\text{)}}$$

Sensory analysis:

The samples from composite flour Biscuits were evaluated by a six untrained panelists, who evaluate the product for appearance, color, texture, flavor and overall acceptability (Krokida *et al*, 1999). This panel was selected randomly on the basis of gender and age and was briefly acquainted with the sensory characteristics that were to be judged and also with the available scales according to which the samples were to be rated. The panel members were requested to assemble at one place prior to evaluation as the samples were required to be judged immediately when opened. Each member was provided with the sensory evaluation rating scales based on which the rating was given to various samples. The average values of the rating given by all the members were then calculated and used for further analysis.

The sensory evaluation scale for rating the sensory quality of composite flour biscuit was developed on the basis of four main parameters i.e. color, flavor, texture and appearance and these quality characteristics of the samples were examined by using the rating scales. Color scales was slightly modified to judge only the browning of biscuits and general appearance as the consumer assessment of quality is normally based on these modified conditions. The flavor was rated by smelling the sample. The texture was rated by checking hardness and softness of the surface of biscuit sample. The samples scoring an overall quality of 7 or above were only considered and those receiving 6 or below were considered unacceptable.

3.3.6 Different samples of composite flour biscuits:





Plate no 3.5: Different Treatments of Biscuit



3.3.7 Sensory Evaluation of Biscuits by untrained panel





Plate no 3.6: Sensory Evaluation of Biscuits by untrained panel

III. RESULTS AND DISCUSSION

This chapter includes the results of physic-chemical composition of the composite flour biscuits.

Physico-Chemical Properties of Biscuits

The physic-chemical properties of wheat flour, green gram flour and maize flour biscuits were determined in the Department of Agricultural Process Engineering and Technology.

Table 4.1 shows the physic-chemical composition of composite flour biscuits. From the table it can be seen that Moisture content varied from 2 to 5 and Ash content varied from 1.2 to 2 %

A different sample has different moisture content and ash content depending upon its composition of Green gram, Wheat and Maize flour in it.

The highest Moisture content was found in treatment T3 followed by T2 and T4, where lower moisture content was found in T6 and T5. The highest Ash content was found in treatment T3 followed by T2 and T5, whereas lower Ash content was found in T1 and T6.

Physico-chemical composition of composite flour Biscuits

Table: The Physico-chemical Composition of Biscuit

Sr. no.	Samples	Moisture content (%)	Ash content (%)
1.	T1	2.65	1.2
2.	T2	3.83	1.64
3.	T3	4.99	1.88
4.	T4	3.10	1.14
5.	T5	2.25	1.42
6.	T6	2.09	1.12

4.2 Sensory Evaluation of Biscuits

Sensory evaluation was done by untrained panel. There was six untrained panel. Sensory evaluation of composite flour biscuits was carried out on the basis of 9-point Hedonic scale. Parameters consider for sensory evaluation was Appearance, Color, Flavor, Taste and Texture.

The data on sensory evaluation of Biscuits are presented in Table 4.2.

Table 4.2: Sensory Evaluation of Biscuits

Parameter	Sensory Score					
	T1	T2	T3	T4	T5	T6
Appearance	7	6	7	7	5	7
Color	7	7	6	7	4	7
Flavor	7	6	7	5	5	7
Taste	7	5	6	7	4	7
Texture	7	7	6	7	5	6

For the sample T1, the average mean score for appearance was 7, the average mean score for color was 7, the average mean score for Flavor was 7, the average mean score for taste was 7, the average mean score for texture was 7. For the sample T2, the average mean score for appearance was 6, the average mean score for color was 7, the average mean score for Flavor was 6, the average mean score for taste was 5, the average mean score for texture was 7. For the sample T3, the average mean score for appearance was 7, the average mean score for color was 6, the average

mean score for Flavor was 7, the average mean score for taste was 6, the average mean score for texture was 6. For the sample T4, the average mean score for appearance was 7, the average mean score for color was 7, the average mean score for Flavor was 5, the average mean score for taste was 7, the average mean score for texture was 7. For the sample T5, the average mean score for appearance was 5, the average mean score for color was 4, the average mean score for Flavor was 5, the average mean score for taste was 4, the average mean score for texture was 5. For

the sample T6, the average mean score for appearance was 7, the average mean score for color was 7, the average

mean score for Flavor was 7, the average mean score for taste was 7, the average mean score for texture was 6.

Physical Evaluation of biscuits

Table 4.3: Physical Evaluation

Sr. no.	Samples	Thickness (cm)	Width (cm)	Spread ratio (%)	Volume (cm ³)
1.	T1	0.56	5.5	9.82	13.30
2.	T2	0.5	5.6	11.2	12.31
3.	T3	0.7	5.7	8.14	17.86
4.	T4	0.6	5.6	9.33	14.77
5.	T5	0.55	5.6	10.18	13.54
6.	T6	0.58	5.3	9.13	12.79

The table 4.3 shows the Physical evaluation of composite flour biscuits. From the table it can be seen that, Thickness, Width, Spread ratio and Volume varied from 0.5 to 0.7, 5.3 to 5.7, 8.14 to 11.2 and 12.79 to 17.86

Summery and Conclusion

Summary:

The flour of Green Gram, Wheat and Maize were procured from market. These three flours were mixed in different proportions. Sugar, cardamom powder, ghee and composite flour were mixed in required proportion and make dough. After making dough biscuits were baked in oven and prepare a composite flour biscuits. Sensory evaluation of composite flour biscuit was done on the basis of 9-point Hedonic scale and also on the physic-chemical parameters.

IV. CONCLUSION

Based on above study following conclusion were drawn:

- Sensory score for Appearance varies from 5 to 7, color varies from 4 to 7, flavor varies from 5 to 7, taste varies from 4 to 7 and texture varies from 5 to 7.
- From Physical composition of composite flour biscuits it can be seen that Thickness, Width, Spread ratio and Volume varied from 0.5 to 0.7, 5.3 to 5.7, 8.14 to 11.2 and 12.79 to 17.86
- From physic-chemical composition of composite flour biscuits it can be seen that
- Moisture content varied from 2 to 5 and Ash content varied from 1.2 to 2 %
- It was evident from the experiment that composite flour biscuits can be made by mixing flours such as:

Wheat flour, Green Gram flour and Maize flours. This type of Biscuits was useful in diets. Also these Biscuits have good nutritional and sensory quality.

- From above study it can be concluded that treatment T1 consisting of 25:25:50 (Green Gram: Wheat: Maize) composition was best.

Suggestion for future work:

Addition of different flavors in composite flour biscuit can be done.

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